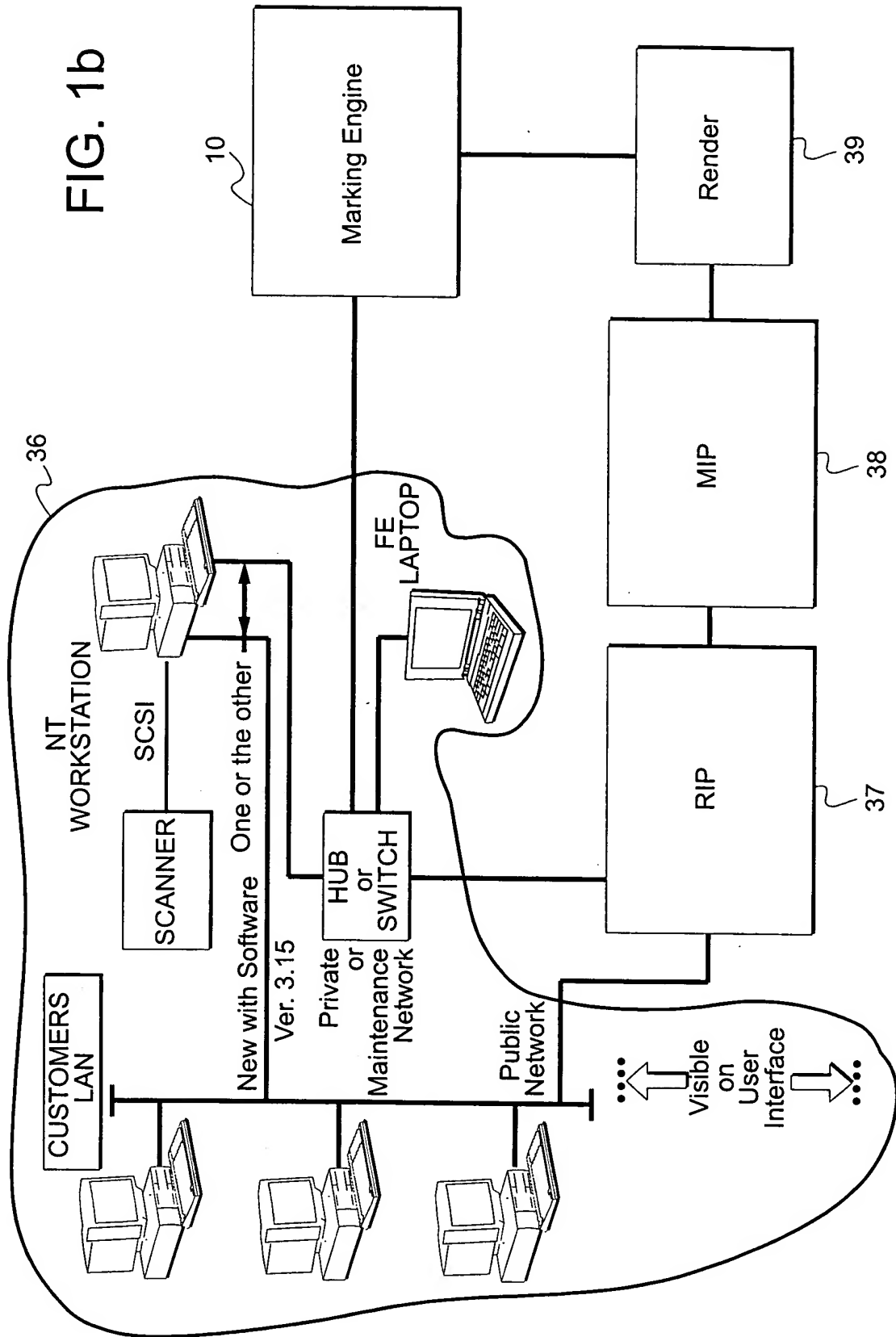


FIG. 1a

FIG. 1b



# Algorithm Block Diagram

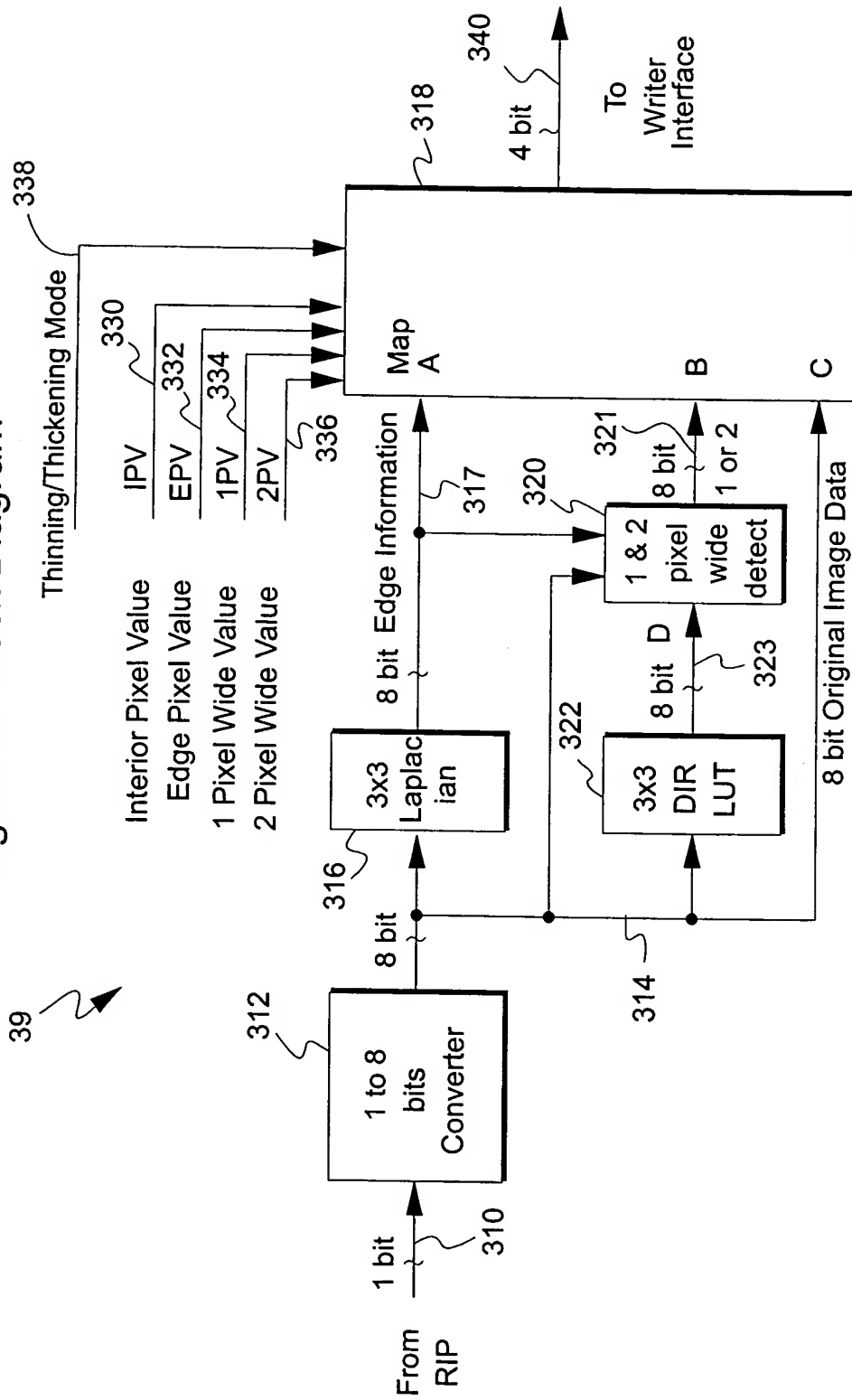


FIG. 2

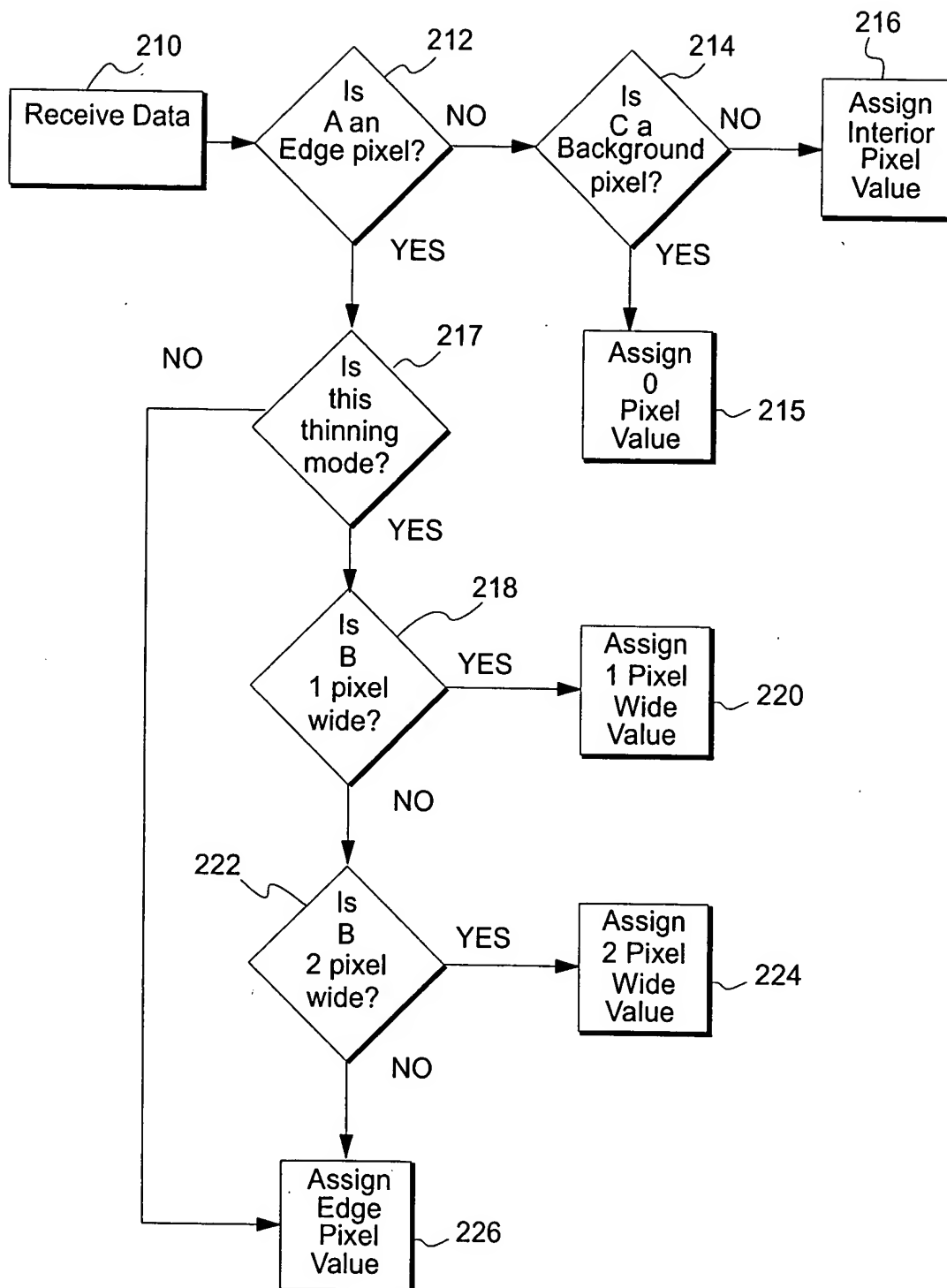


FIG. 3

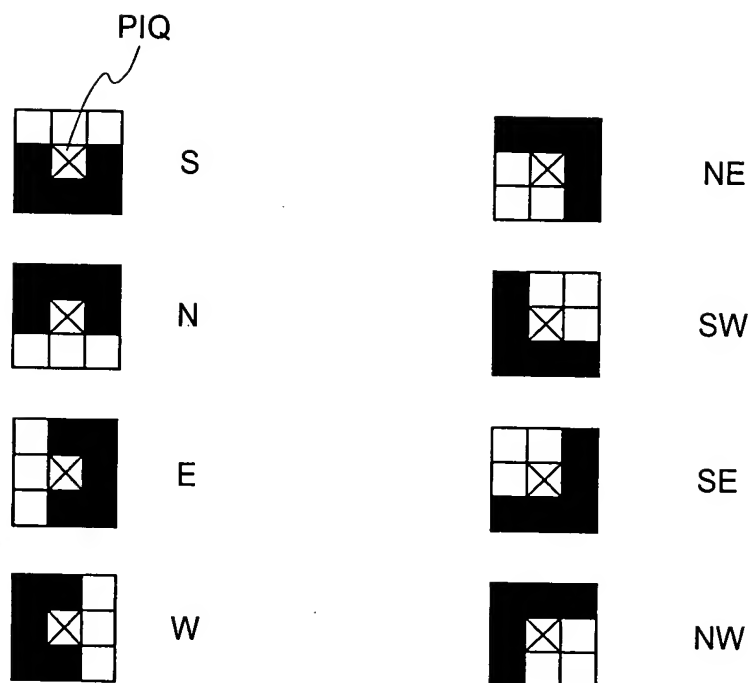
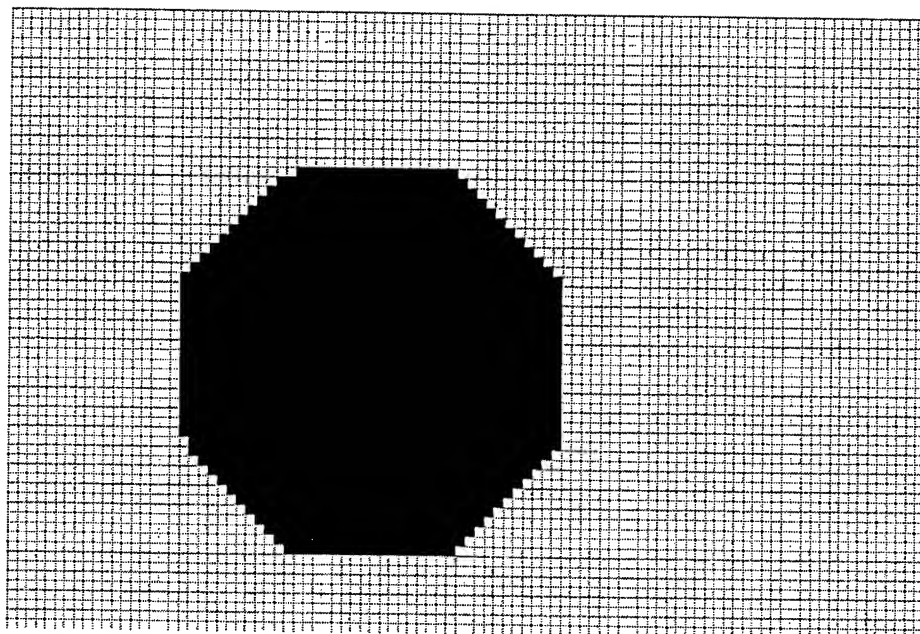
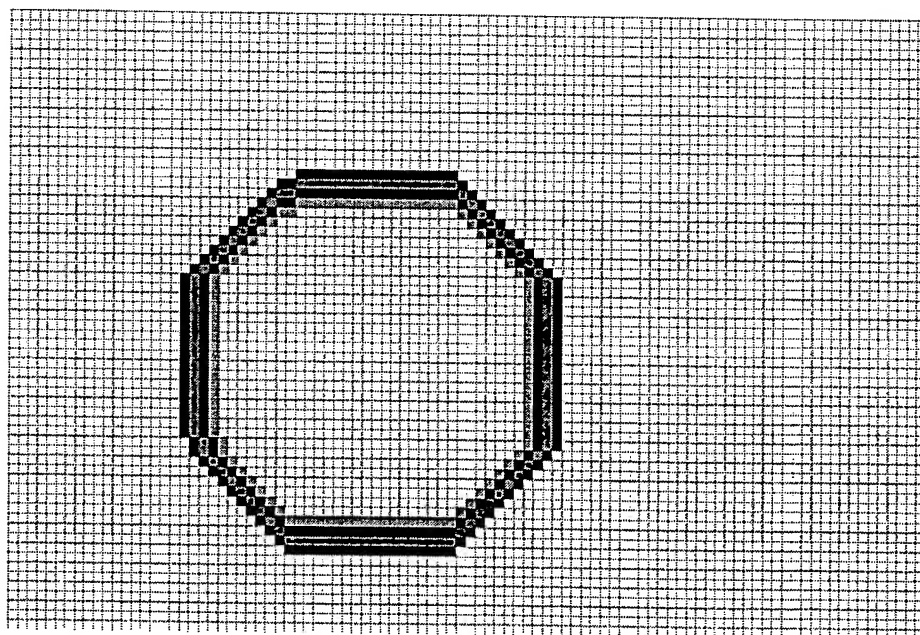


FIG. 4



**Fig. 5a**  
Original object bitmap



**Fig. 5b**  
Four onion skin layers  
when thinning

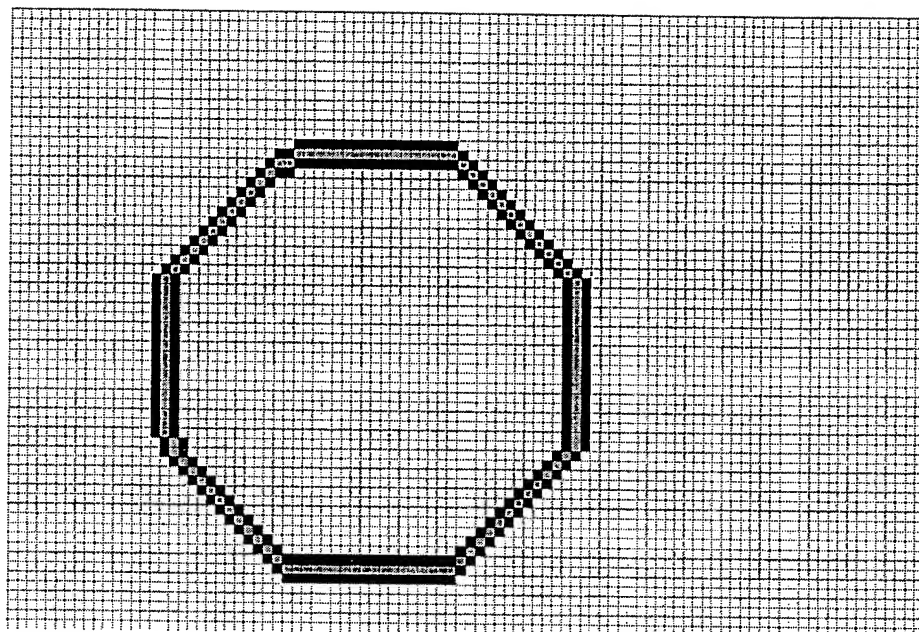


Figure 5c  
Three onion skin layers  
when thickening

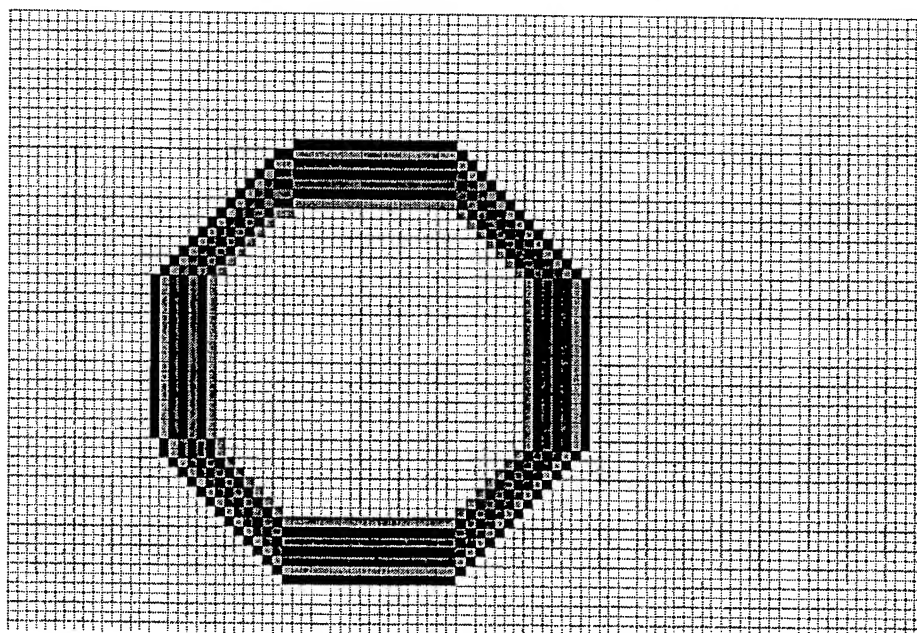


Fig. 5d  
All layers  
(thickening and thinning)

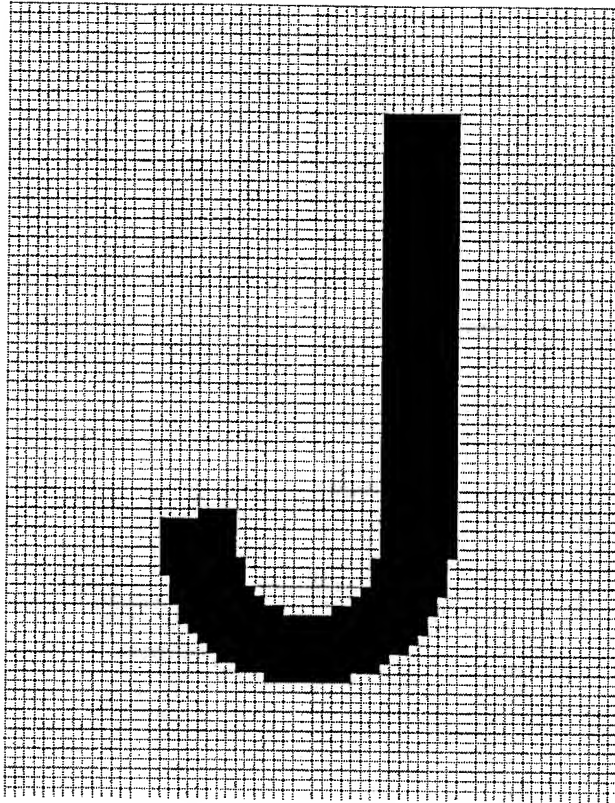


Fig. 6a  
Original

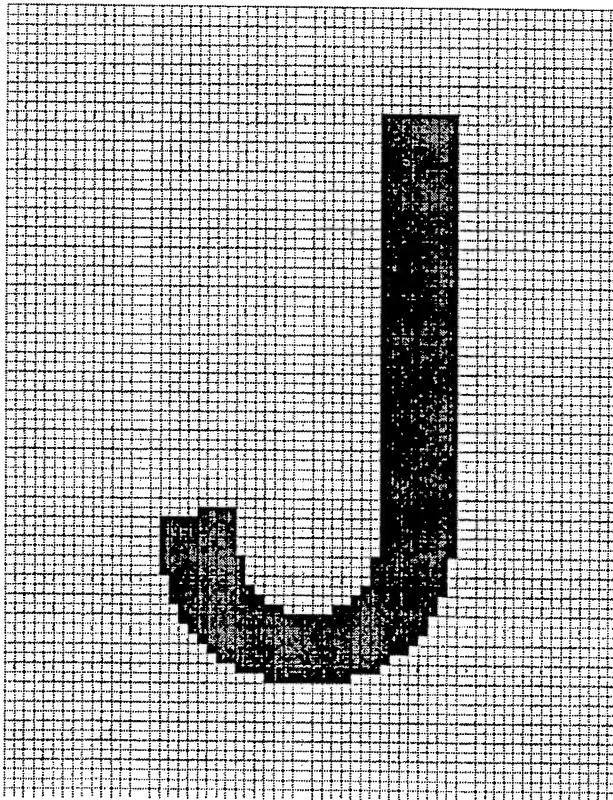


Fig. 6b  
Same grey pixel value  
assigned to edges and  
solid area density



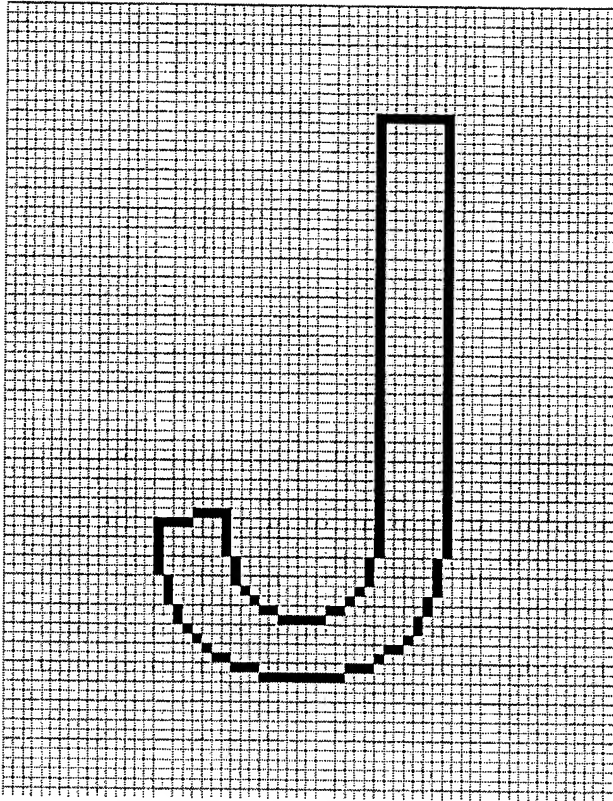


Fig. 6c  
Edges when  
thinning

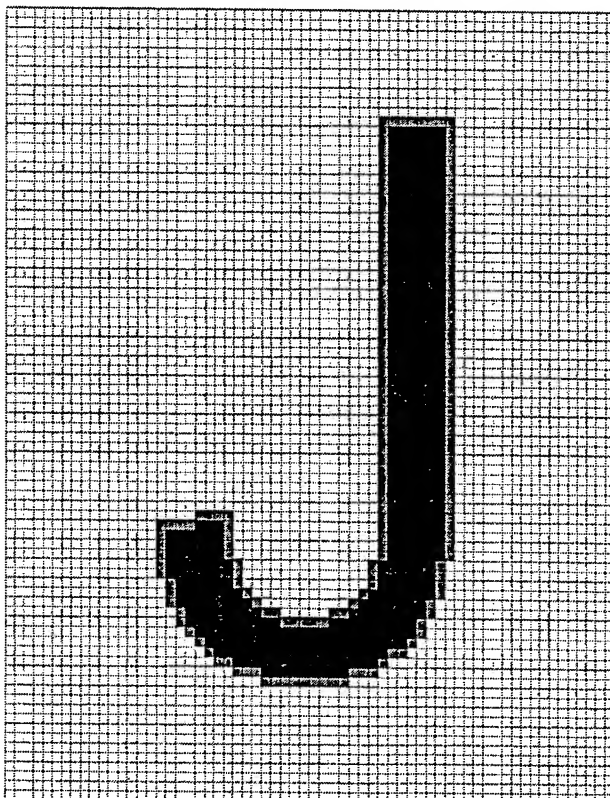


Fig. 6d  
Lightened -  
Solid area density reduced  
Letter thinner

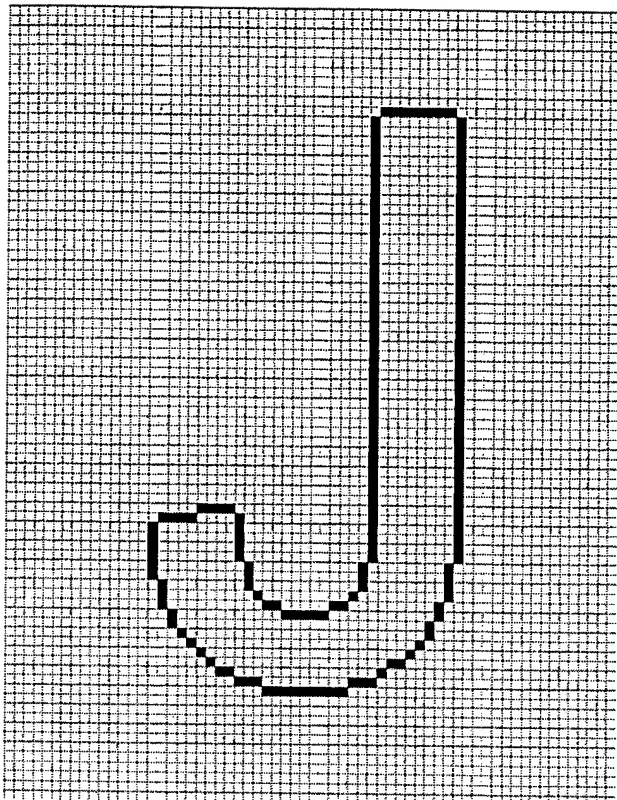


Fig. 6e  
Edges when  
thickening

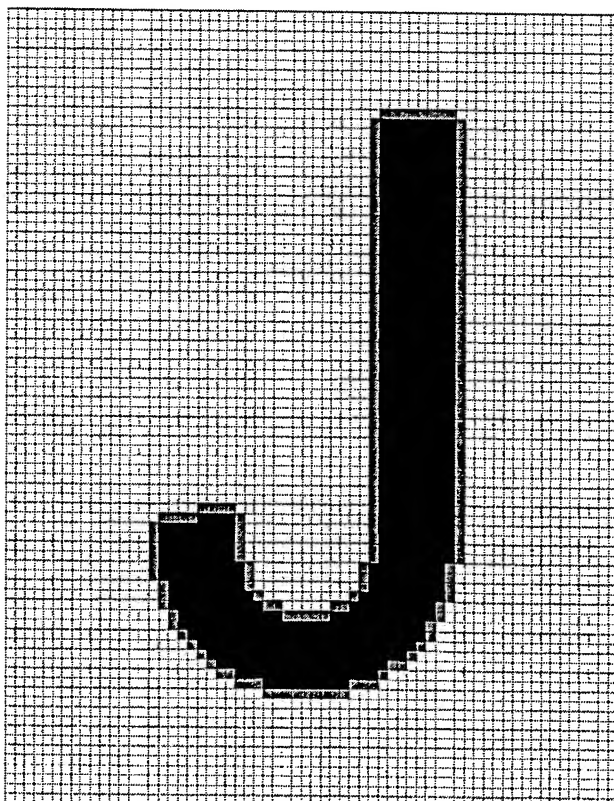
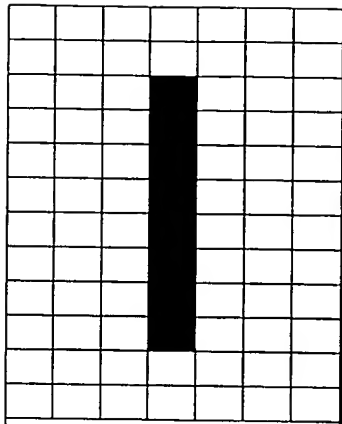


Fig. 6f  
Thickened  
Letter thickened by  
applying grey edges which  
were originally white

# 1 Pixel Wide Detection

Original 1 pixel wide line

FIG. 7a



Edge Pixels

FIG. 7b

0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

Direction Values

FIG. 7c

0	0	0	0	0	0	0
0	0	SE	S	SW	0	0
0	0	E	S	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	N	W	0	0
0	0	NE	N	NW	0	0
0	0	0	0	0	0	0

Assignment

BP: Background Pixel

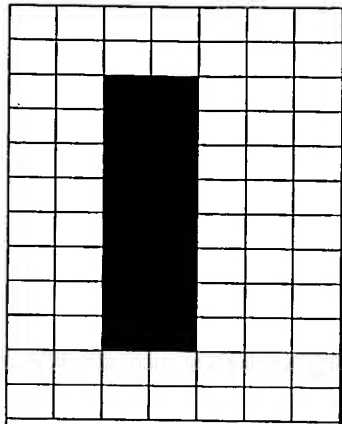
EP: Edge Pixel

1W: One Pixel Wide Line

FIG. 7d

BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	EP	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	EP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP

## 2 Pixel Wide Detection



Original 2 pixel wide line

FIG. 8a

0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	255	255	0	0	0
0	0	255	255	0	0	0
0	0	255	255	0	0	0
0	0	255	255	0	0	0
0	0	255	255	0	0	0
0	0	255	255	0	0	0
0	0	255	255	0	0	0
0	0	255	255	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

Edge Pixels

FIG. 8b

0	0	0	0	0	0	0
0	SE	S	S	SW	0	0
0	E	SE	SW	W	0	0
0	E	E	W	W	0	0
0	E	E	W	W	0	0
0	E	E	W	W	0	0
0	E	E	W	W	0	0
0	E	E	W	W	0	0
0	E	E	W	W	0	0
0	E	NE	NW	W	0	0
0	NE	N	N	NW	0	0
0	0	0	0	0	0	0

Direction Values

FIG. 8c

BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP
BP	BP	EP	EP	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP
BP	BP	EP	EP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP

Assignment

BP: Background Pixel

EP: Edge Pixel

2W: Two Pixel Wide Line

FIG. 8d

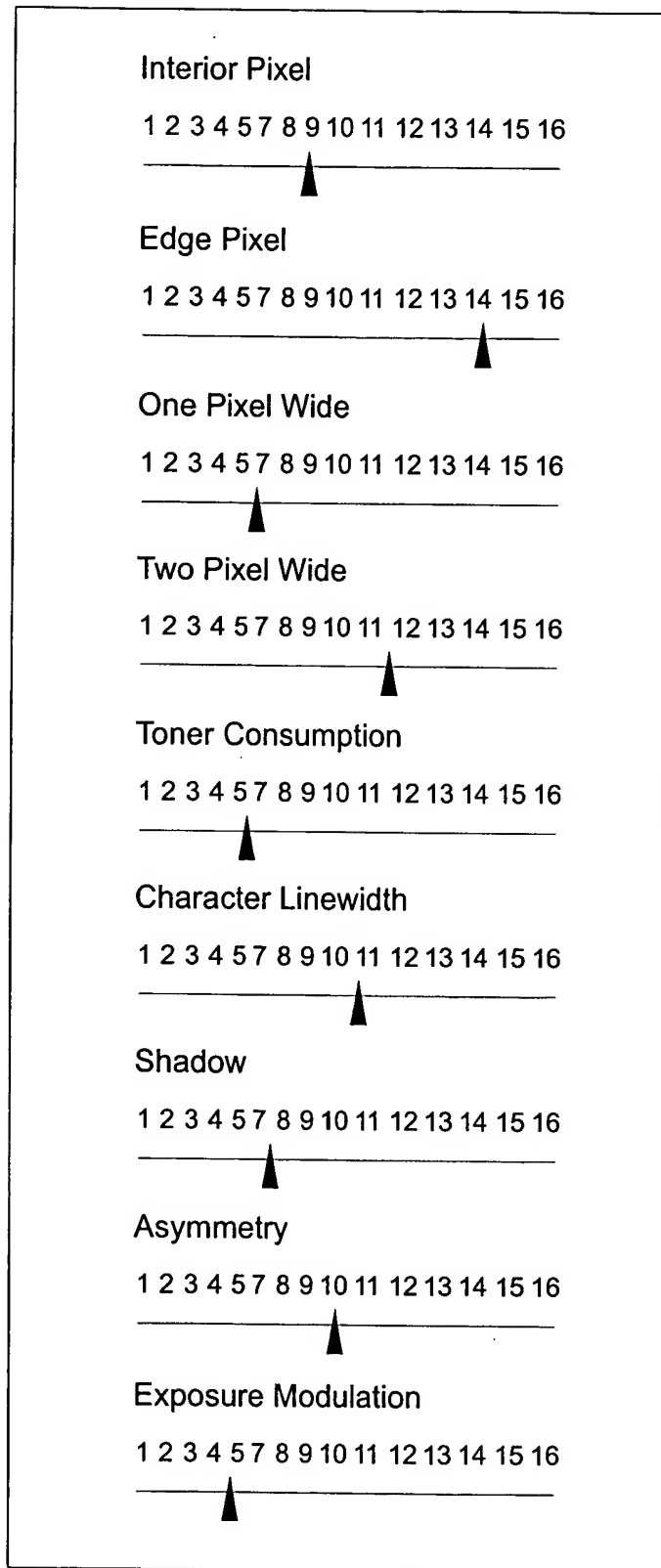


FIG. 9



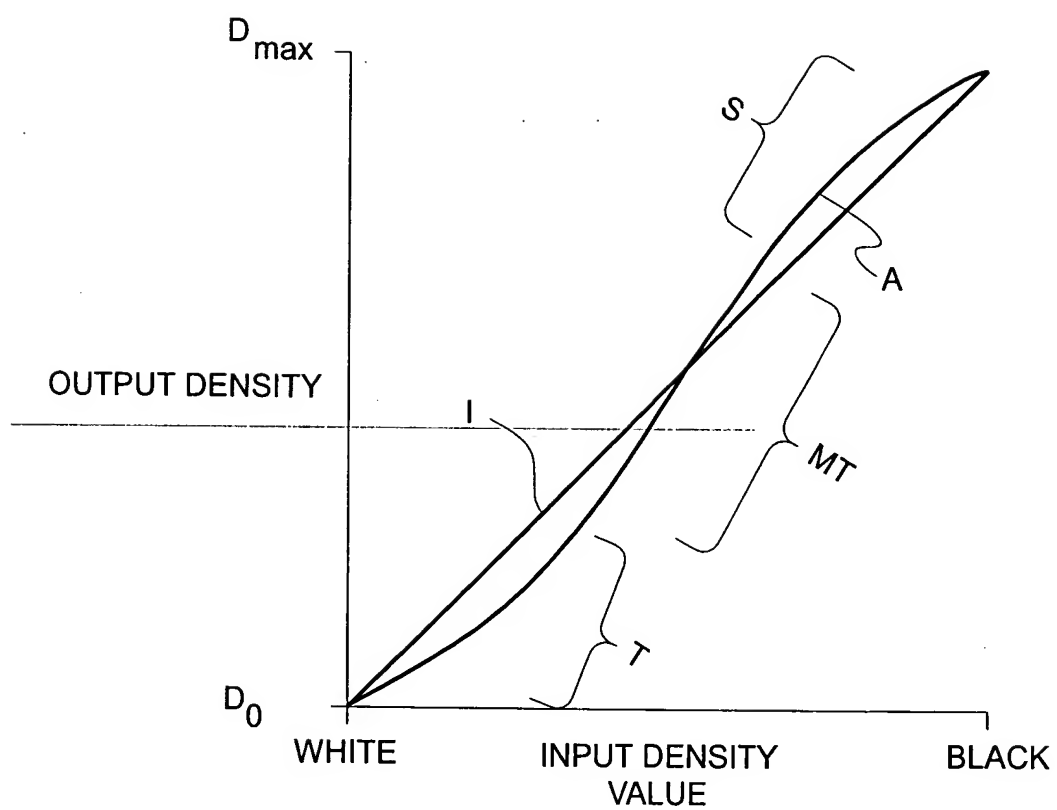


FIG. 11

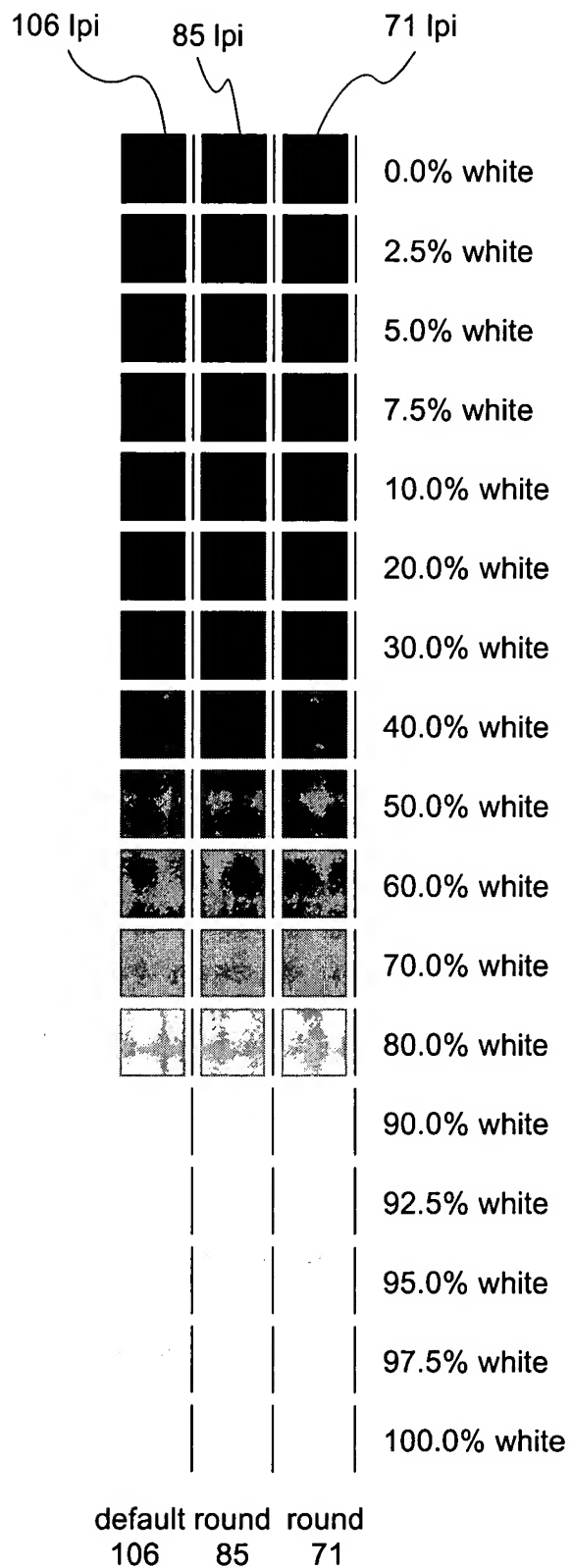


FIG. 12



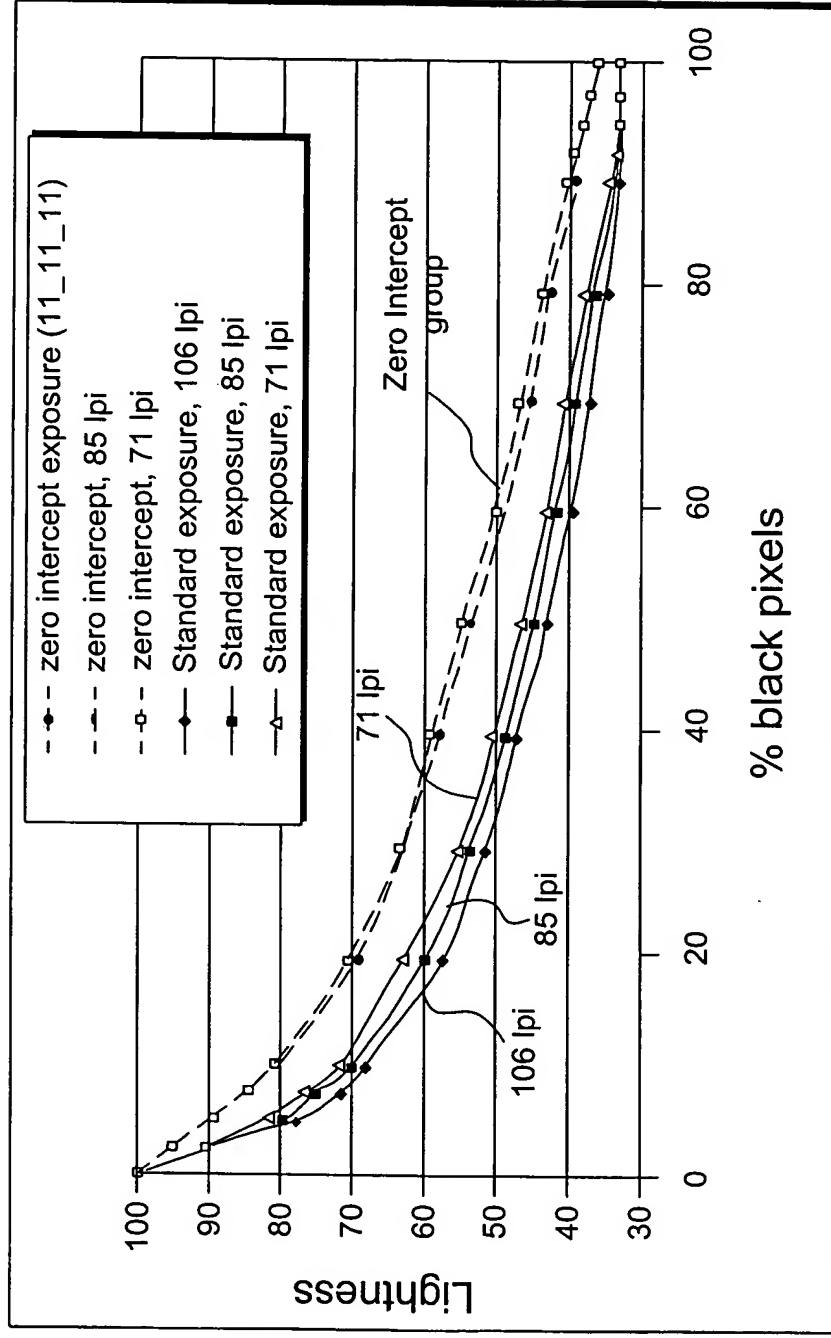


FIG. 13

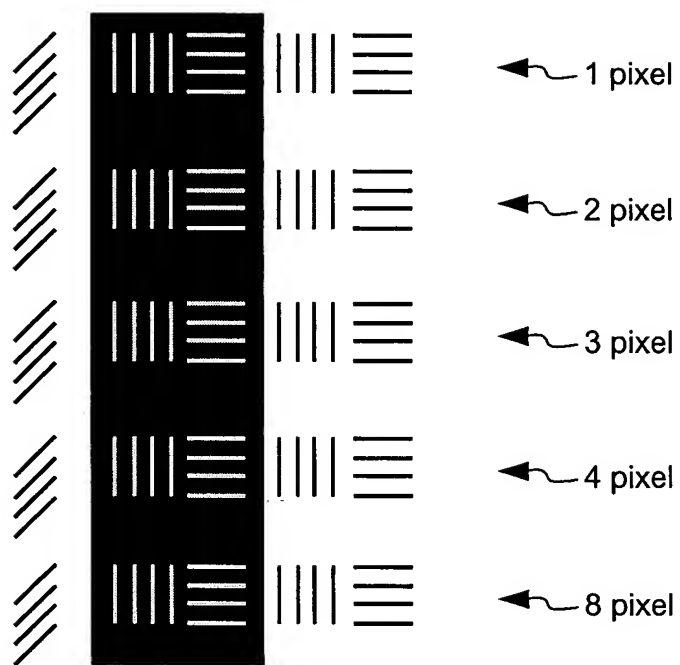


FIG. 14

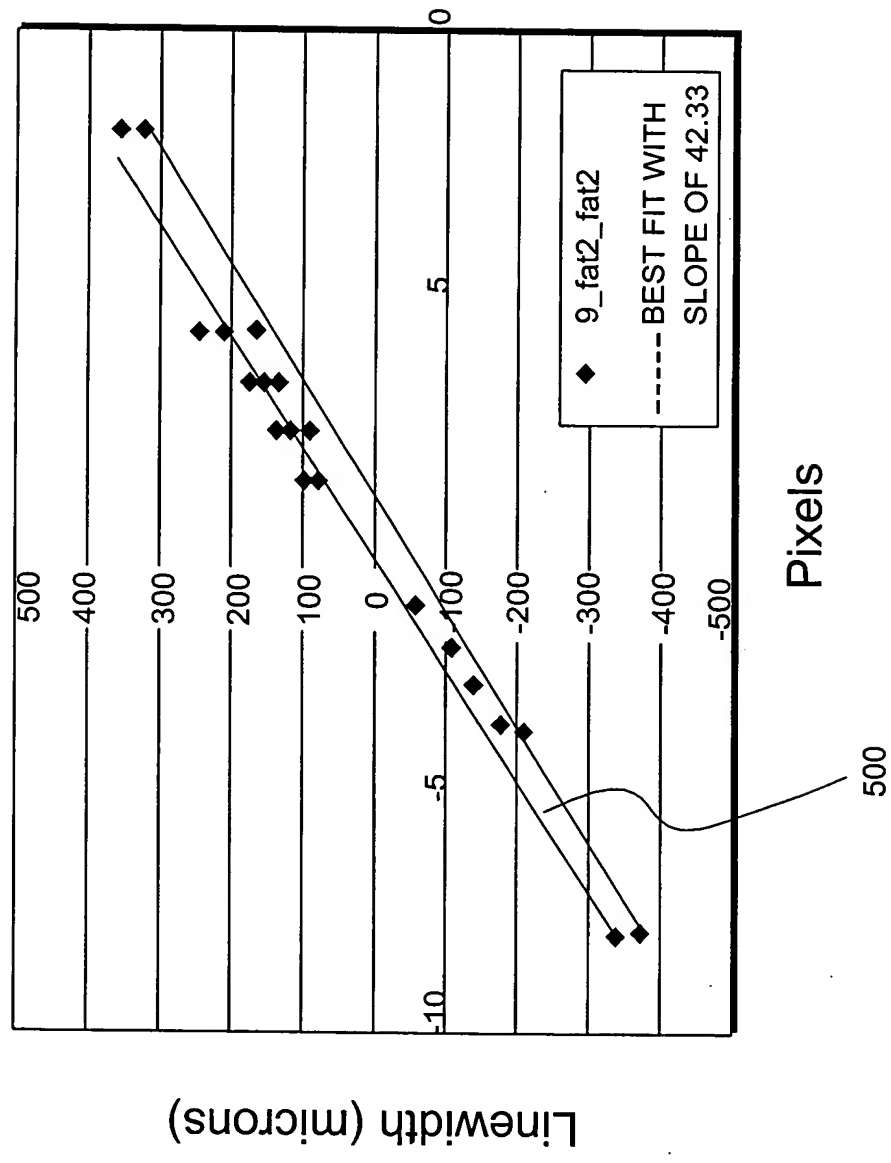


FIG. 15

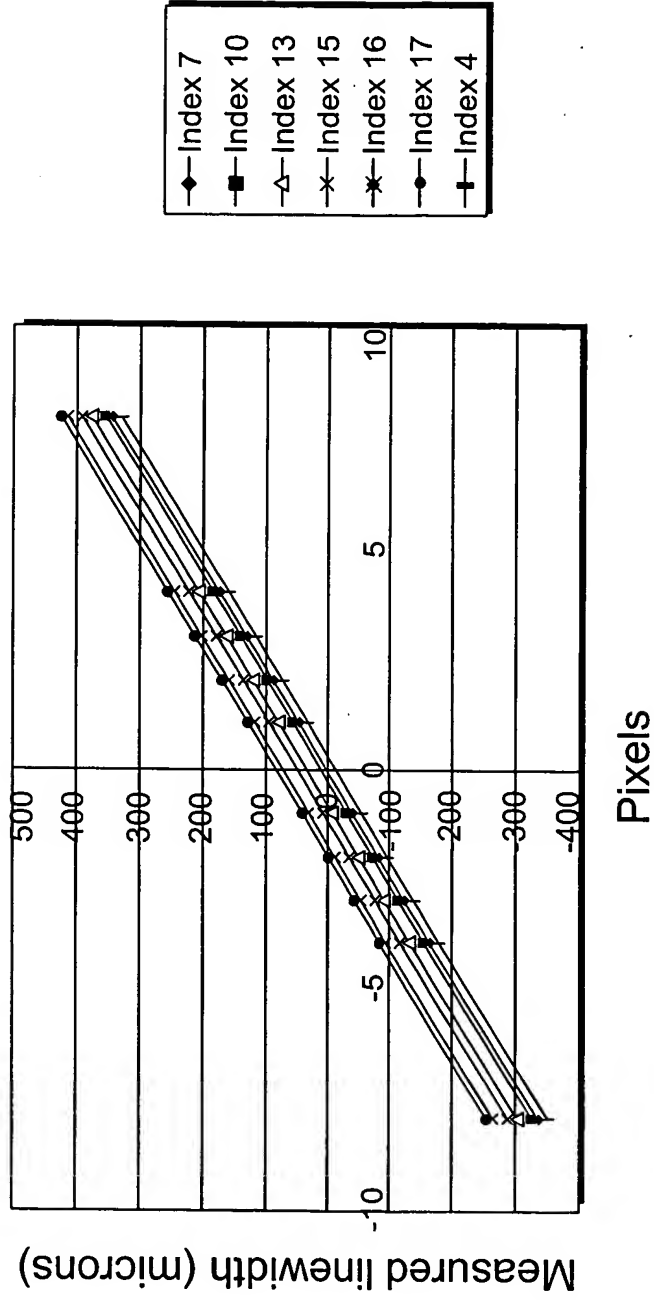


FIG. 16

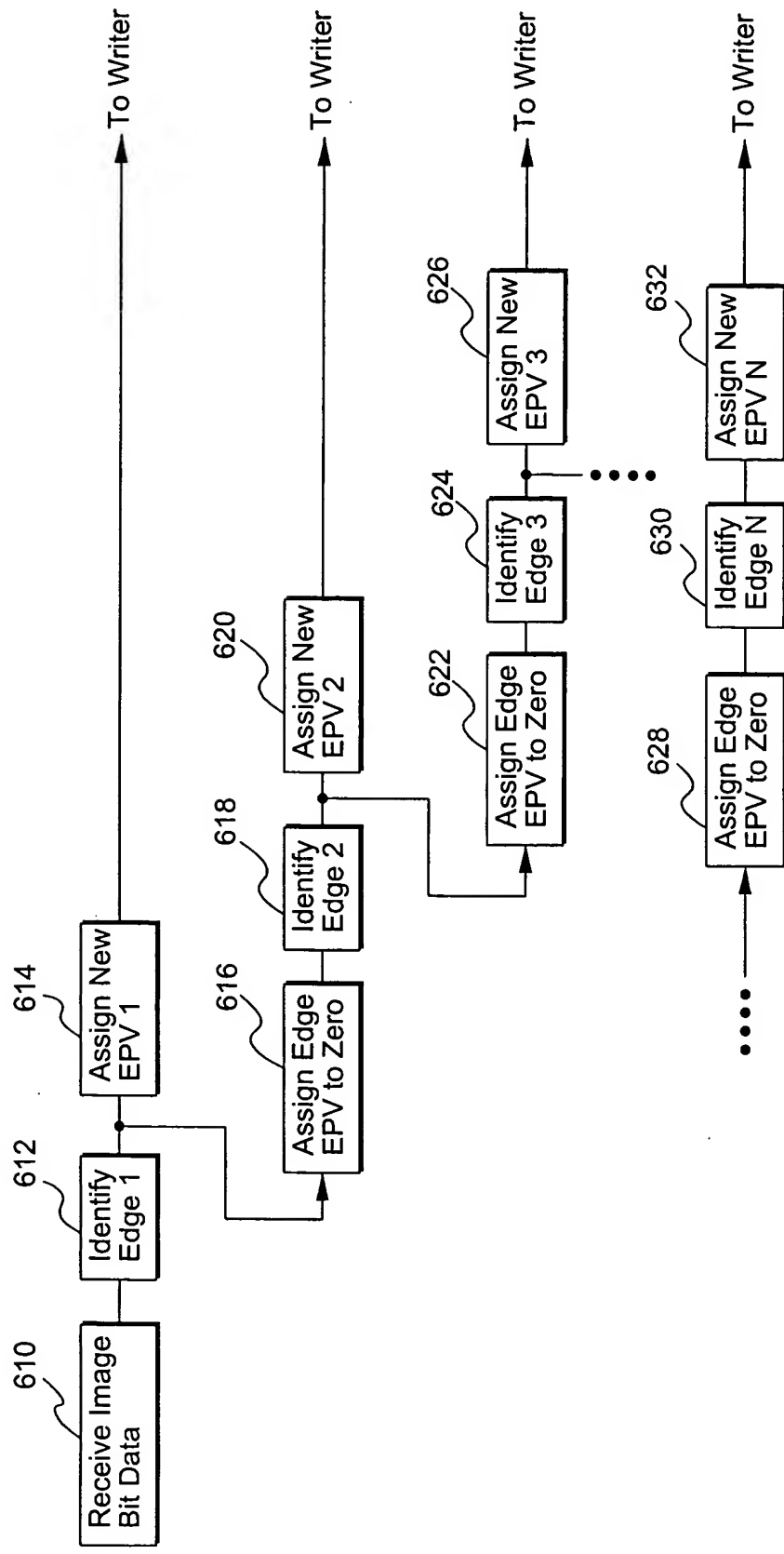


FIG. 17

FIG. 18a

b7	b6	b5
b4	PIQ	b3
b2	b1	b0

FIG. 18b

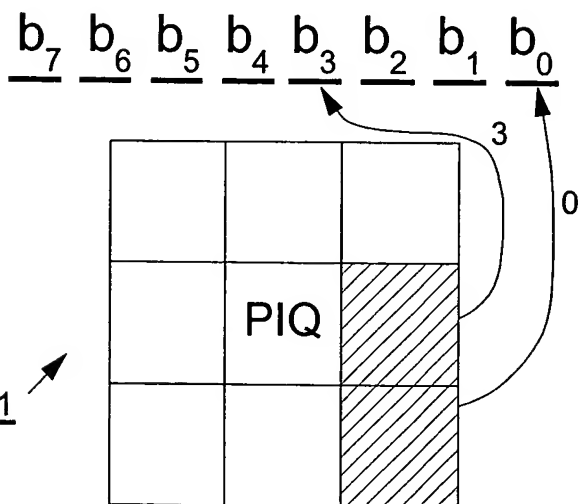
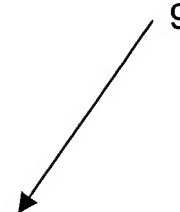


FIG. 18c

00001001

Fig. 18d

9



0	SE	S	S	SW	S	S	S	E	E	SE	SE	SE	SE	S	SE
W	SW	SW	S	W	SW	SW	SW	0	SE	S	S	SW	S	S	S
NE	E	SE	SE	0	SE	S	S	E	E	E	SE	E	E	SE	SE
NW	0	SW	S	W	SW	SW	S	NE	E	SE	SE	0	SE	S	S
N	NE	0	SE	NW	0	SW	S	NE	E	E	E	NE	E	SE	SE
NW	NW	W	SW	W	W	W	SW	N	NE	0	SE	NW	0	SW	S
N	NE	NE	E	N	NE	0	SE	NE	NE	E	E	NE	E	E	E
N	N	NW	0	NW	NW	W	SW	N	NE	NE	E	N	NE	0	SE
NW	0	SW	S	W	SW	SW	S	NE	E	SE	SE	0	SE	S	S
W	W	W	SW	W	W	SW	SW	NW	0	SW	S	W	SW	SW	S
N	NE	0	SE	NW	0	SW	S	NE	E	E	E	NE	E	SE	SE
NW	NW	W	SW	W	W	W	SW	N	NE	0	SE	NW	0	SW	S
N	N	NW	0	NW	NW	W	SW	N	NE	NE	E	N	NE	0	SE
NW	NW	W	W	NW	W	W	W	N	N	NW	0	NW	NW	W	SW
N	N	N	NE	N	N	NW	0	NE	NE	NE	E	N	NE	NE	E
NW	N	NW	NW	NW	NW	W	W	N	N	N	NE	N	N	NW	0